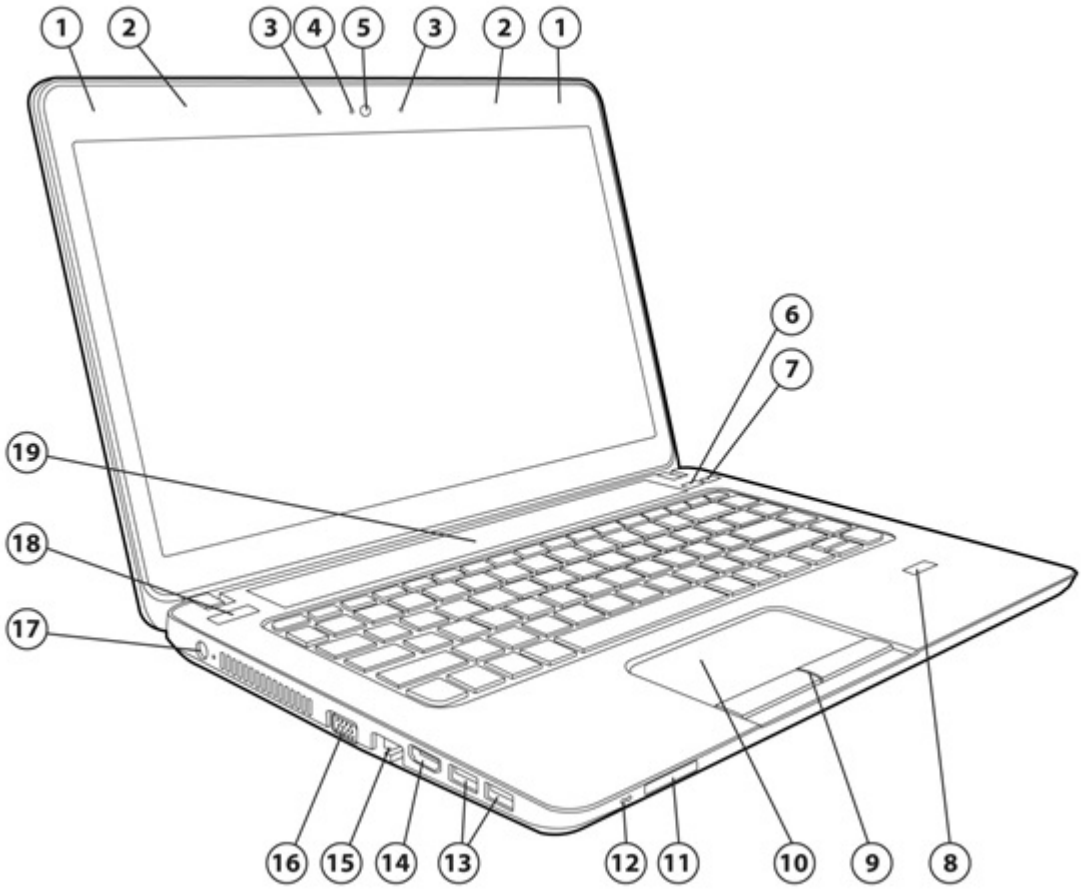
HP ProBook 440 G1 Notebook PC

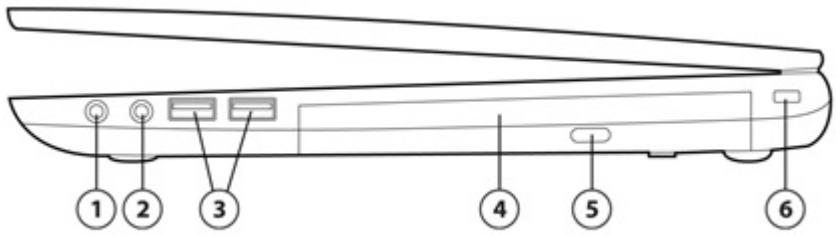


Front/Left

1. WWAN antennas (2)* (select models only)
2. WLAN antennas**
3. Dual-array microphone***
4. Webcam light***
5. Webcam (select model models only)
6. Wireless on/off button
7. Speaker mute button
8. Optional Fingerprint Reader
9. Touchpad pick buttons
10. Touchpad
11. Media Card Reader
12. Hard drive activity LED indicator
13. USB 3.0 ports (2)
14. HDMI port
15. RJ-45 (network) jack
    RJ-45 (network) lights (2)
16. VGA monitor port
17. Power connector
18. Power button
19. Speakers (2)

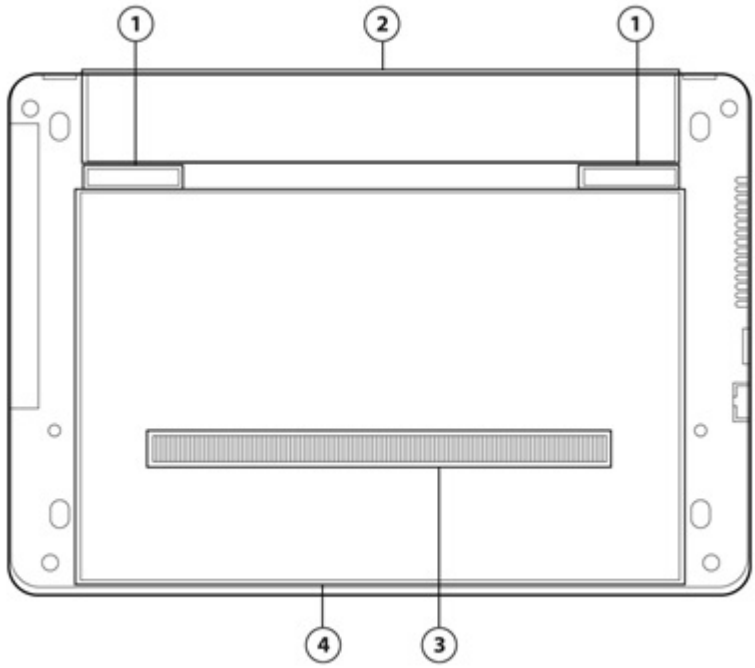
* The antennas are not visible from the outside of the computer. For optimal transmission, keep the areas immediately around the antennas free from obstructions.
** The number of WLAN antennas in the displays is determined by the WLAN selected
*** Feature is available with select models with webcam configuration.

Overview



Right

1. Audio-out (headphone) jack
2. Audio-in (microphone) jack
3. USB 2.0 ports (2)
4. Optical drive (select models only)
5. Optical drive eject button (select models only)
6. Security lock slot

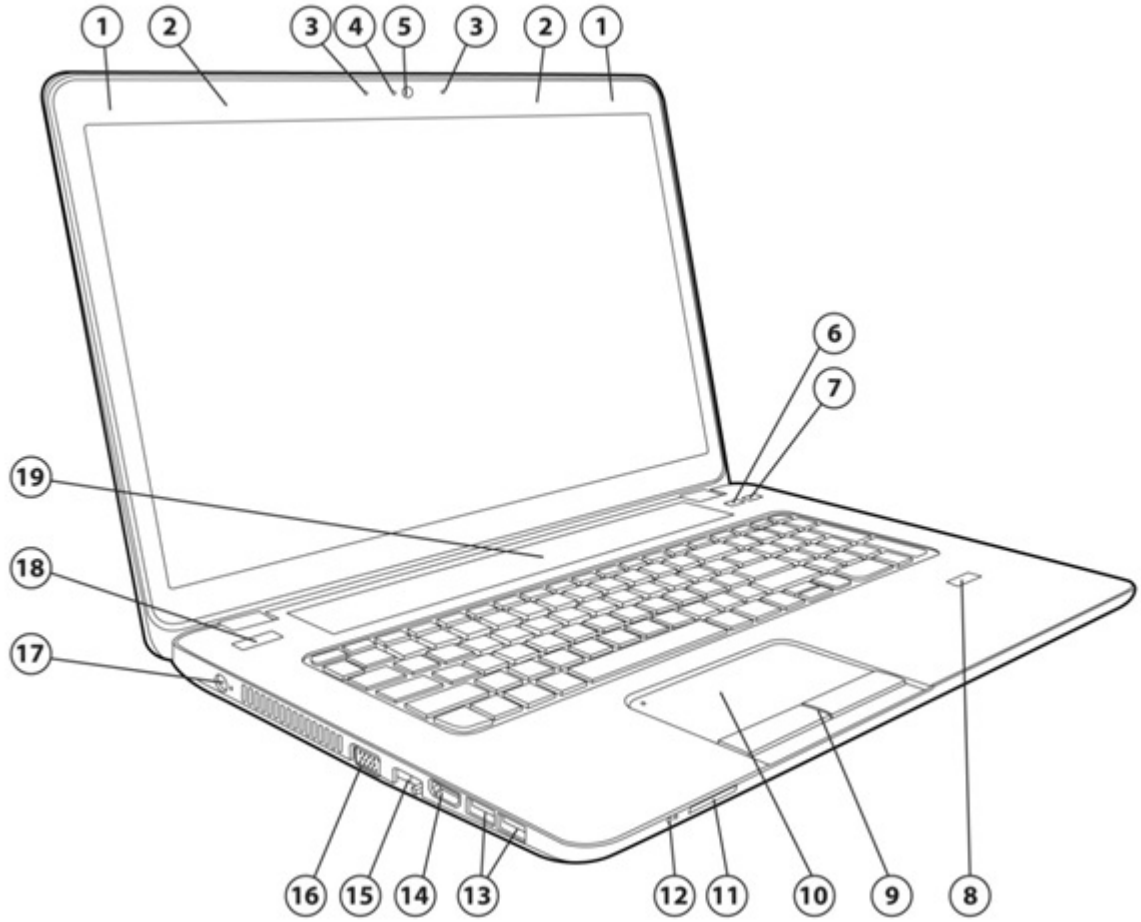


Bottom

1. Battery and service door release latches
2. Battery bay
3. Vents
4. Service door

HP ProBook 450 G1 Notebook PC

Overview



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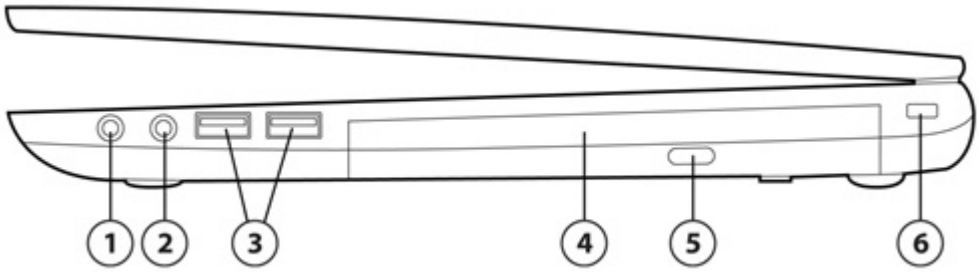

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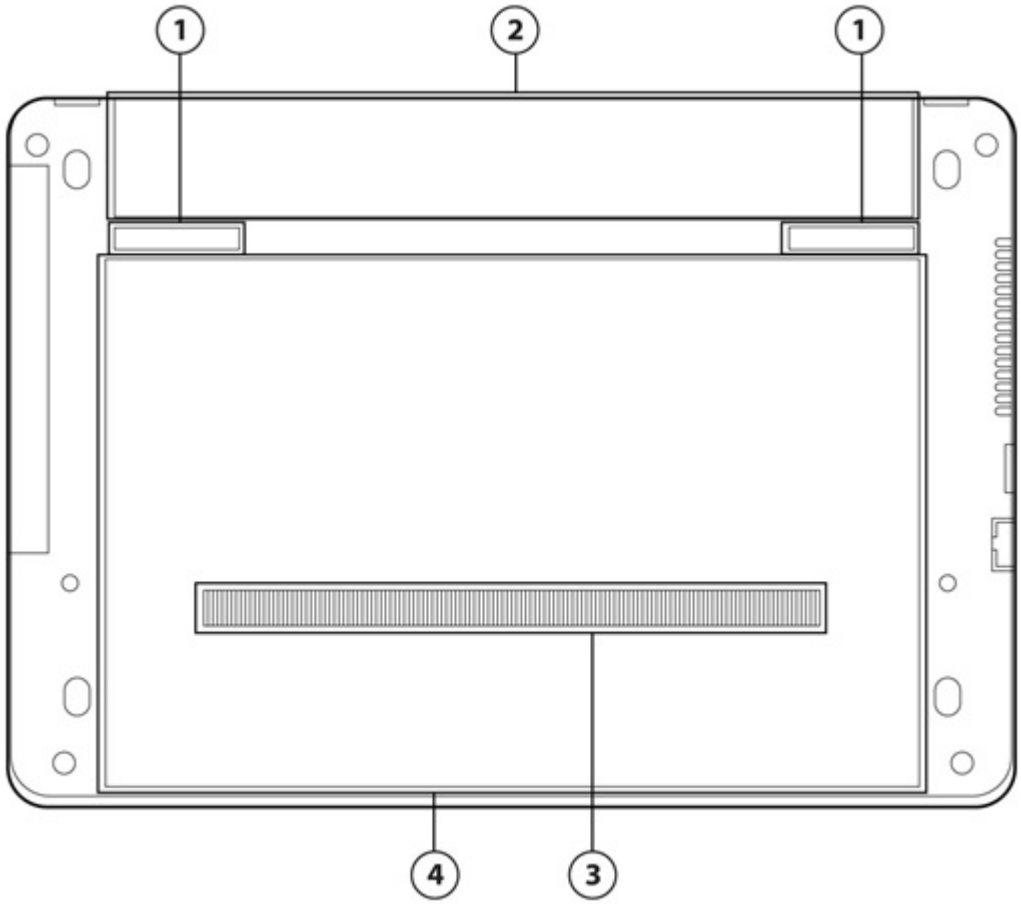

Bottom

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2. Battery bay
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At A Glance

- Windows 8.1 versions, Windows 8, Windows 7 versions, SUSE Linux, or FreeDOS
- Aluminum reinforced chassis with multi-layer soft touch paint that keep system looking good longer
- Full-sized spill-resistant keyboard; full separate numeric keypad (HP ProBook 450 only)
- Larger Touchpad with gestures support, on/off button with LED indicator
- Enhanced security features including HP Client Security and optional HP Fingerprint Reader
- Optional HD webcam with dual-microphone array for video conferencing*
- HDMI port for connecting to high-resolution displays; USB 3.0 ports
- DTS Sound+ optimized for high fidelity audio
- Widescreen LED-backlit HD display with 16:9 aspect ratio with available 15.6-inch diagonal HD, 15.6-inch diagonal HD with Touch option (HP ProBook 450), 14-inch diagonal HD (HP ProBook 440)
- Choice of 4th generation Intel® Core™ i7, i5 and i3 processors, Intel Celeron and Pentium processor
- Wireless on/off and speaker mute buttons for convenient management of the connectivity and speaker.
- Flexible wireless connectivity options:
    - Integrated HP Mobile Broadband Module (HP ProBook 440 G1 and 450 G1 selective models)
    - Integrated 802.11 b/g/n wireless LAN module
    - Integrated 802.11 a/b/g/n/AC, a/b/g/n or b/g/n with Bluetooth 4.0 combo card

* Optional on models with integrated graphics only.

NOTE: See important legal disclosures for all listed specs in their respective features sections.

Features

PRODUCT NAMES

HP ProBook 440 G1 Notebook PC
HP ProBook 450 G1 Notebook PC

OPERATING SYSTEM

Preinstalled

Windows 8.1 Pro 64*
Windows 7 Professional (available through downgrade rights from Windows 8.1 Pro**
Windows 8.1 64*
Windows 8 Pro 64*
Windows 7 Professional (available through downgrade rights from Windows 8 Pro**
Windows 8 64*
Windows 7 Professional 64***
Windows 7 Home Premium 64***
Windows 7 Home Basic 64***
SUSE Linux Enterprise Desktop 11
FreeDOS

* Not all features are available in all editions of Windows 8/8.1. Systems may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows 8/8.1 functionality. See http://www.microsoft.com for details.
** This system is preinstalled with Windows® 7 Pro software and also comes with a license and media for Windows 8 Pro software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data.
*** Not all features are available in all editions of Windows 7. This system may require upgraded and/or separately purchased hardware to take full advantage of Windows 7 functionality. See http://www.microsoft.com/windows/windows-7/ for details.

PROCESSOR

4th Generation Intel® Core™ i7-4702MQ (2.2GHz, 6MB L3 cache, 4 cores)
Up to 3.2GHz with Intel Turbo Boost Technology
4th Generation Intel® Core™ i5-4200M (2.5GHz, 3MB L3 cache, 2 cores)
Up to 3.1GHz with Intel Turbo Boost Technology
4th Generation Intel® Core™ i3-4100M (2.5GHz, 3MB L3 cache, 2 cores)
4th Generation Intel® Core™ i3-4000M (2.4GHz, 3MB L3 cache, 2 cores)
Intel® Pentium 3550M (2.3GHz, 2MB L3 cache, 2 cores)
Intel® Celeron 2950M (2.0GHz, 2MB L3 cache, 2 cores)

* Multi-Core is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. 64-bit computing on Intel® architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers, and applications enabled for Intel® 64 architecture. Processors will not operate (including 32-bit operation) without an Intel® 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. Intel's numbering is not a measurement of higher performance.
NOTE: Processor speed denotes maximum performance mode; processors will run at lower speeds in battery optimization mode.

Features

CHIPSET

Mobile Intel® HM87 Express

GRAPHICS

Integrated*:
Intel HD** Graphics 4600 (4th Generation Intel Quad-Core i7 and Dual-Core i5 and i3)
Intel HD** Graphics (Celeron and Pentium configurations)
Switchable Discrete:
AMD Radeon™ HD** 8750M, with 1 or 2 GB dedicated DDR3 video memory***

* HP ProBook 440 and 450 only.
** HD content required to view HD images.
*** AMD Dynamic Switchable Graphics technology requires either an AMD "A" series APU or an Intel processor, plus an AMD Radeon™ discrete graphics configuration and is not available on FreeDOS and Linux OS. With AMD Dynamic Switchable Graphics technology, full enablement of all discrete graphics video and display features may not be supported on all systems (e.g. OpenGL applications will run on the integrated GPU or the APU as the case may be).

DISPLAY

HP ProBook 440 G1

Internal
14" diagonal LED-backlit HD anti-glare (1366 x 768)
External
Up to 32-bit per pixel color depth
VGA
Port supports resolutions up to 1920 x 1080 external resolution @60 Hz
HDMI
Supports direct connection to high-definition displays with up to 1920 x 1200@60Hz resolution and 7-channel audio with one convenient cable (not included)

NOTE: HD content required to view HD images.
NOTE: Resolutions are dependent upon monitor capability, and resolution and color depth settings.

HP ProBook 450 G1

Internal
15.6" diagonal LED-backlit HD Touch Display is shatter, scratch, and smudge resistant (1366 x 768)
15.6" diagonal LED-backlit HD anti-glare (1366 x 768)
External
Up to 32-bit per pixel color depth
VGA
Port supports resolutions up to 1920 x 1080 external resolution @60 Hz
HDMI
Supports direct connection to high-definition displays with up to 1920 x 1200@60Hz resolution and 7-channel audio with one convenient cable (not included)

NOTE: HD content required to view HD images.

Features

NOTE: Resolutions are dependent upon monitor capability, and resolution and color depth settings.

STORAGE AND DRIVES

Primary Storage Bay
Hard Drives
320/500/750 GB**/1 TB** 5400 rpm SMART SATA II HDD;
500 GB** 7200 rpm SMART SATA II HDD
750GB** 7200 rpm SMART SATA II HDD (available on 450 G1 only)
500 GB** 5400 rpm SMART SATA II Hybrid HDD/SSHD

Solid State Drive*
128 GB** 2.5" Solid State Drive

HP 3D DriveGuard (Windows only)
The hard drive is mounted directly to the notebook frame, reducing the transmission of shock to the hard drive

* Available on 450G1 only
**For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 16 GB (for Windows 7) and 36 GB (for Windows 8) of system disk is reserved for the system recovery software.

OPTICAL DRIVES

Fixed 9.5 mm SATA optical drive
Blu-ray ROM DVD+/-RW SuperMulti DL Drive*†
DVD+/-RW SuperMulti DL Drive*
DVD-ROM Drive
No optical drive option

* Sold separately as an optional feature.
† For Blu-ray drives, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-ray titles to play, they may require an HDMI digital connection and your display may require HDCP support. HD-DVD disks cannot be played on this drive. Note that DVD-RAM cannot read or write to 2.6GB Single Sided/5.2 GB Double Sided - Version 1.0 media. Actual speeds may vary. Don't copy copyright-protected materials. Double Layer discs can store more data than single layer discs; discs burned with this drive may not be compatible with many existing single-layer DVD drives and players.

Features

MEMORY

Standard
DDR3L 1.35V SDRAM (1600 MHz)
Two SODIMM slots supporting dual-channel memory
4 GB and 8 GB SODIMMs*
Maximum
Upgradeable to 16384 MB with optional 8192 MB SODIMMs in slots 1 and 2
Dual-channel
Maximized dual-channel performance requires SODIMMs of the same size and speed in both memory slots.

NOTE: Due to the non-industry standard nature of some third-party memory modules, we recommend HP branded memory to ensure compatibility. If you mix memory speeds, the system will perform at the lower memory speed. With Windows Starter 32-bit operating systems, the amount of usable memory is dependent upon your configuration, so that above 3 GB all memory may not be available due to system resource requirements.

NETWORKING/COMMUNICATIONS

Wireless

Support for a broad range of secure, integrated wireless LAN and wireless WAN options featuring support for the latest industry standards. Broadband Wireless (WWAN) requires a Windows operating system and is available in select countries as a standard, factory configurable feature only. Integrated Bluetooth is also available (factory configurable only) and can be combined with any of the supported wireless LAN and wireless WAN options.

Broadband Wireless (WWAN)

HP hs3110 HSPA+ Mobile Broadband Module*

Wireless LAN (WLAN)***

Realtek 802.11 b/g/n (1x1)***
Atheros 802.11 b/g/n (1x1) with Bluetooth® v4.0 combo***
Intel Dual Band Wireless-AC 3160 802.11 a/b/g/n/ac (1x1) WiFi with Bluetooth 4.0 combo***, ****
Intel Dual Band Wireless-AC 7260AN 802.11 a/b/g/n/ac (2x2) WiFi with Bluetooth 4.0 combo (Non vPro)
Intel Dual Band Wireless-N 7260AN 802.11 a/b/g/n (2x2) WiFi with Bluetooth 4.0 combo***

NOTE: Supports Bluetooth® v2.1 on Linux operating systems
* WWAN is an optional feature sold separately or as an add on feature. WWAN connection requires wireless data service contract, network support, and is not available in all areas. Contact service provider to determine the coverage area and availability. Connection speeds will vary due to location, environment, network conditions, and other factors.
** 4G LTE not available on all products, in all regions and only available on products featuring Intel processors.
***Wireless access point and Internet service is required and is not included. Availability of public wireless access points limited.
**** The specifications for the 802.11ac WLAN are draft specifications and are not final. If the final specifications differ from the draft specifications, it may affect the ability of the notebook to communicate with other 802.11ac WLAN devices.

Communications

Realtek 10/100/1000* Ethernet Controller
* The term "10/100/1000" or "Gigabit" Ethernet indicates compatibility with IEEE standard 802.3ab for Gigabit Ethernet, and does not connote actual operating speed of 1 Gb/s. For high-speed transmission, connection to a Gigabit Ethernet server and network infrastructure is required.

Features

AUDIO/MULTIMEDIA

Audio

DTS Sound+
Integrated stereo speakers
Integrated digital microphone (dual-microphone array when equipped with optional webcam)
Function keys for microphone mute, volume up, volume down
Stereo headphone/line out
Stereo microphone/line in

Webcam

Optional* 720p HD** webcam

- HD format (widescreen)
- Supports videoconferencing (non-HD) and still image capture
- High quality fixed focus lens
- Video capture at various resolutions up to 1280x720 resolution (720p) and up to 30fp
- M-JPEG compression supports higher frame rates for video capture and videoconferencing
- Improved low light sensitivity
- Improved dynamic range
- Skype-ready**

* Sold separately as an optional feature.
** HD content required to view HD images.
*** Internet access required.

KEYBOARDS/POINTING DEVICES/BUTTONS & FUNCTION KEYS

Keyboard

The HP spill-resistant keyboard is designed using a thin layer of Mylar film under the keyboard. The 101/102-key compatible keyboard features a full-pitch key layout with desktop keyboard features, such as editing keys, both left and right control and alt keys, and function keys. US and International key layouts are available. Includes a separate numeric keypad (HP ProBook 450 only).

Pointing Devices

Touchpad with gestures support, on/off button with LED indicator, two-way scroll, two pick buttons

Buttons and Function Keys

Separate launch buttons provide easy access to wireless on/off and speaker mute. Function keys provide control of features including: standby mode, display brightness, external display, microphone mute, volume down, and volume up.

SOFTWARE AND SECURITY

Preinstalled Software with Windows Operating System

HP Wireless Hotspot*
HP ePrint (HP Exclusive)***
HP Hotkey support
HP 3D Driveguard (Windows required)
PDF Complete Corporate Edition****
Skype ready *****
HP Recovery Manager
HP Support Assistant
Buy Office

Features

Intel Wireless Display******

NOTE: HP Recovery Manager enables fast recovery of the factory preinstalled image if the system becomes corrupted or if important system files are accidentally deleted. Up to 16 GB (for Windows 7) and 36 GB (for Windows 8) of system disk is reserved for the system recovery software.

* The wireless hotspot application requires an active internet connection and separately purchased data plan. While HP wireless hotspot is active, on-device applications will continue to work and will use the same data plan as the wireless hotspot. Wireless hotspot data usage may incur additional charges. Check with your service providerfor plan details. Requires Windows.
** Internet access required.
*** Requires an Internet connection to HP web-enabled printer and HP ePrint account registration (for a list of eligible printers, supported documents and image types and other HP ePrint details, see www.hp.com/go/eprintcenter).Requires optional broadband module. Broadband use requires separately purchased service contract. Check with service provider for coverage and availability in your area. Separately purchased data plans or usage fees may apply. Print times and connection speeds may vary.
**** PDF Complete Corporate Edition includes 50 PDF creations or six months, whichever comes first. Purchase license afterwards for full functionality.
*****Skype-ready. Skype is not offered in China.
****** Integrated Intel Wi-Di feature is available on select configurations only and requires separately purchased projector, tv or computer monitor with an integrated or external Wi-Di receiver. External Wi-Di receivers connect to the projector, tv or computer monitor via a standard HDMI cable, also sold separately.

Security

Standard
HP Client Security (Windows only)
HP Trust Circles Standard (Available in Fall 2013)
Microsoft Security Essentials(Windows 7)/Microsoft Defender (Windows 8)*
HP Drive Encryption**
HP BIOS Protection***
Security lock slot
TPM 1.2 Embedded Security Chip

Optional
Intel® Anti-Theft (requires a Computrace subscription)****
Intel Identity Protection*****
HP Fingerprint reader

NOTE: The Absolute Persistence agent is shipped turned off, and must be activated by customers when they purchase a subscription. Subscriptions can be purchased for terms ranging multiple years. Service is limited, check with Absolute for availability outside the U.S.
* Opt in and internet connection required for updates.
** Requires Windows. Data is protected prior to Drive Encryption login. Turning the PC off or into hibernate logs out of Drive Encryption and prevents data access. Drive encryption planned to be available in October 2013.
*** HP Tools partition with an HP BIOS required for automatic recovery.
**** Intel Anti-Theft security is supported on Intel Core i processors and requires a separately purchased Absolute Computrace service subscription and must be activated and configured. Check with Absolute for availability in your country. Intel and HP assume no liability for lost or stolen data and/or systems or any other damages resulting therefrom. See http://www.intel.com/technology/anti-theft/.
***** Intel Identity Protection feature is only available with Intel Core Processors. Intel® IPT security requires separate Symantec VIP software service subscription and must be activated and configured. Requires a website that uses Symantec VIP Authentication Service and Microsoft® Windows. Intel® and HP assume no liability for lost or stolen data and/or systems or any other damages resulting therefrom.

Features

For more information on HP security solutions refer to: http://www.hp.com/go/security.

POWER

Power Supply

HP ProBook 440 G1 Notebook PC
Models with discrete graphics:
External 90W HP Smart AC Adapter
Models with integrated graphics:
External 65W HP Smart AC Adapter
Power cord included is 3.28-foot (1 meter).
Total length including external AC adapter is 9.38 feet (2.86 meter).
HP Fast Charge*

HP ProBook 450 G1 Notebook PC
Models with discrete graphics:
External 90W HP Smart AC Adapter
Models with integrated graphics:
External 65W HP Smart AC Adapter
Power cord included is 3.28-foot (1 meter).
Total length including external AC adapter is 9.38 feet (2.86 meter).
HP Fast Charge*

Primary Battery
HP 9-cell Lithium-Ion Battery (93 WHr)
HP 6-cell Lithium-Ion Battery (47 WHr)
HP 6-cell Long Life Lithium-Ion Battery (51 WHr) - available on 440 G1 only, available in March

Battery Life with Windows 7

	Configurations with integrated graphics	Configurations with discrete graphics
HP ProBook 440		
9-cell (93 WHr) battery	Up to 17 hours 30 mins	Up to 17 hours 30 mins
6-cell (47 WHr) battery	Up to 9 hours 15 mins	Up to 9 hours
HP ProBook 450		
9-cell (93 WHr) battery	Up to 17 hours 15 mins	Up to 17 hours
6-cell (47 WHr) battery	Up to 9 hours 15 mins	Up to 9 hours

System Standby Time*
Up to 12 days

* Windows 7 battery life will vary depending on numerous factors including product model, configuration, loaded applications, features, use, wireless functionality, and power management settings. The maximum capacity of the battery will naturally decrease with time and usage. See www.bapco.com for additional details.
** Standby life will vary depending on various factors including battery, Memory, CPU, EC and LAN chip. The maximum capacity of the battery will naturally decrease with time and usage.

NOTE: Fast Charge recharges your battery up to 90% within 90 minutes when the system is off (6-cell only).

Power Conservation
Supports enhanced Intel SpeedStep technology (allows Battery Optimized Mode, Maximum Performance Mode, or Automatic

mode)
AMD PowerPlay technology (discrete models)
Hibernation
Standby
ACPI compliance

WEIGHTS & DIMENSIONS

HP ProBook 440 G1 Notebook PC

Weight
Starting at 4.63 lb (2.10 kg) with optical drive (weight will vary by configuration)
Starting at 4.34 lb (1.97 kg) without optical drive (weight will vary by configuration)

Dimensions (w x d x h)
13.35 x 9.38 x 0.88 (front) -1.12 in (at rear)
33.92 x 23.85 x 2.24 (front) - 2.86 cm (at rear)

HP ProBook 450 G1 Notebook PC

Weight
Starting at 5.22 lb (2.37 kg) with optical drive without touch (weight will vary by configuration)
Starting at 4.98 lb (2.26 kg) without optical drive without touch (weight will vary by configuration)
Starting at 5.84 lb (2.65 kg) with optical drive with touch (weight will vary by configuration)
Starting at 5.6 lb (2.54 kg) without optical drive with touch (weight will vary by configuration)
Dimension (wxdxh)
14.76 x 10.09 x 0.9 (front) - 1.14 in (at rear) (non-Touch)
37.5 x 25.6 x 2.28 (front) - 2.9 cm (at rear) (non-Touch)
14.76 x 10.09 x 0.95 (front) - 1.20 in(at rear) (Touch)
37.5 x 25.6 x 2.42(front) - 3.0 4cm(at rear) (Touch)

PORTS/SLOTS

USB 3.0 – Two
USB 2.0 – Two
HDMI 1.4a – One
Stereo microphone input – One
Headphone/line out – One
RJ-45 (Ethernet) – One
Power connector – One
VGA – One

Digital Media Slots
Multi Media Reader Slot supporting SD, SDHC, SDXC, Memory Stick, MSXC

SERVICE AND SUPPORT

HP Services offers limited 1-year and 90-day warranty options depending on country;
1-year limited warranty on primary battery. On-site service and warranty upgrades are also available. HP Care Pack Services extend service contracts beyond the standard warranties. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at: http://www.hp.com/go/lookuptool. Consult the HP Customer Support Center for details. http://h20000.www2.hp.com/bizsupport/TechSupport/ProductRoot.jsp.

SYSTEM UNIT

Stand-Alone Power Requirements (AC Power)	**Nominal Operating Voltage**	19 V	
	Average Operating Power	**Windows 7 (64-bit)**	**Windows 8 (64-bit)**
	ProBook 440 Integrated graphics	8.81 W	9.08 W
	ProBook 440 Discrete graphics	9.38 W	9.65 W
	ProBook 450 Integrated graphics	8.8 W	8.7 W
	ProBook 450 Discrete graphics	9.68 W	9.22 W
	Max Operating Power	Discrete < 90W UMA < 65W	
Temperature	**Operating**	32° to 95° F (0° to 35° C) (not writing optical) 41° to 95° F (5° to 35° C) (writing optical)	
	Non-operating	-4° to 140° F (-20° to 60° C)	
Relative Humidity	**Operating**	10% to 90%, non-condensing	
	Non-operating	5% to 95%, 101.6° F (38.7° C) maximum wet bulb temperature	
Shock	**Operating**	40 G, 2 ms, half-sine	
	Non-operating	200 G, 2 ms, half-sine	
Random Vibration	**Operating**	0.75 grms	
	Non-operating	1.50 grms	
Altitude (unpressurized)	**Operating**	-50 to 10,000 ft (-15.24 to 3,048 m)	
	Non-operating	-50 to 40,000 ft (-15.24 to 12,192 m)	
Planned Industry Standard Certifications	**UL**	Yes	
	CSA	Yes	
	FCC Compliance	Yes	
	ENERGY STAR®	Select models*	
	EPEAT	Registered Gold in United States**	
	ICES	Yes	
	Australia / NZ A-Tick Compliance	Yes	
	CCC	Yes	
	Japan VCCI Compliance	Yes	
	KC	Yes	
	BSMI	Yes	
	CE Marking Compliance	Yes	
	BNCI or BELUS	Yes	
	CIT	Yes	

GOST	Yes
Saudi Arabian Compliance (ICCP)	Yes
SABS	Yes
UKRSERTCOMPUTER	Yes

* Configurations of the HP ProBook 440 G1 and HP ProBook 450 G1 that are ENERGY STAR® qualified are identified as HP ProBook 440 G1 ENERGY STAR and HP ProBook 450 G1 ENERGY STAR on HP websites and on www.energystar.gov.
** EPEAT® registration varies by country. See www.epeat.net for registration status by country.
EPEAT status listed above applies to U.S.

For accessibility information on HP products, please visit: http://www.hp.com/accessibility.

DISPLAYS

14.0-inch LED HD (1366 x 768) anti-glare	**Dimensions** (W x H)	12.63 x 7.39 in (32.09 x 18.76 cm)	
	Weight	0.71 lb (320g) (max)	
	Diagonal Size	14.0 in (35.6cm)	
	Surface Treatment	Anti-glare	
	Contrast Ratio	400:1 (min)	
	Refresh Rate	60 Hz	
	Brightness	200 nit (typical)	
	Pixel Resolution	**Pitch**	0.227 mm
		Format	1366 x 768
		Configuration	RGB Stripe
	Backlight	LED	
	PPI	112 ppi	
	Viewing Angle	±30° Horizontal, ±10° Vertical (minimum) 30/30/20/10 (Left/Right/Down/Up) (minimum) or 45/45/35/25 (Left/Right/Down/Up) (typical)	

Technical Specifications

15.6-inch LED HD (1366 x 768) with Touch	**Dimensions** (W x H)	13.54 x 7.64 in (34.39 x 19.41 cm)	
	Weight	500g max.	
	Diagonal Size	15.6 in (39.6cm)	
	Contrast Ratio	300:1 (min)	
	Refresh Rate	60 Hz	
	Brightness	200 nit (typical)	
	Pixel Resolution	**Pitch**	0.252 x 0.252
		Format	1366 x 768 (HD)
		Configuration	1366 x 768
	Backlight	LED	
	PPI	106 ppi	
	Viewing Angle	±30° Horizontal, ±10° Vertical (minimum) 30/30/20/10 (Left/Right/Down/Up) (minimum) or 45/45/35/25 (Left/Right/Down/Up) (typical)	

15.6-inch LED HD (1366 x 768) anti-glare	**Dimensions** (W x H)	14.17 x 8.83 in (36.0 x 22.43 cm)	
	Weight	500g max.	
	Diagonal Size	15.6 in (39.6cm)	
	Surface Treatment	Anti-glare	
	Contrast Ratio	400:1 (min)	
	Refresh Rate	60 Hz	
	Brightness	200 nit (typical)	
	Pixel Resolution	**Pitch**	0.252 mm
		Format	1366 x 768
		Configuration	RGB Stripe
	Backlight	LED	
	PPI	106 ppi	
	Viewing Angle	±30° Horizontal, ±10° Vertical (minimum) 30/30/20/10 (Left/Right/Down/Up) (minimum) or 45/45/35/25 (Left/Right/Down/Up) (typical)	

STORAGE AND DRIVES

Internal Storage

Technical Specifications

500 GB* 7200 rpm SATA Hard Drive	**Drive Weight**	0.25 lbs (115g)	
	Capacity	500 GB	
	Height	0.37 in (9.5 mm)	
	Width	2.75 in (70 mm)	
	Interface	ATA-8, SATA 2.6, 3.0 Gb/s, NCQ	
	Transfer Rate	**Synchronous** (maximum)	300 MB/s (Drive Capability)
	Seek Time (typical reads, including settling)	**Single Track**	1.5 ms
		Average	11 ms
		Maximum	22 ms
	Rotational Speed	7200 rpm	
	Logical Blocks	976,773,168	
	Operating Temperature	32° to 140° F (0° to 60° C) [case temp]	
	Features	ATA Security	

320 GB* 5400 rpm SATA Hard Drive	**Drive Weight**	0.25 lbs (115 g)	
	Capacity	320 GB	
	Height	0.37 in (9.5 mm)	
	Width	2.75 in (70 mm)	
	Interface	ATA-8, SATA 2.6, 3.0 Gb/s, NCQ	
	Transfer Rate	**Synchronous** (maximum)	300 MB/s (Drive Capability)
	Seek Time (typical reads, including settling)	**Single Track**	1.5 ms
		Average	11 ms
		Maximum	22 ms
	Rotational Speed	7200 rpm	
	Logical Blocks	625,142,448	
	Operating Temperature	32° to 140° F (0° to 60° C) [case temp]	
	Features	ATA Security	

Technical Specifications

500 GB* 5400 rpm SATA Hard Drive	**Drive Weight**	0.22 lb (101 g)	
	Capacity	500 GB	
	Height	0.37 in (9.5 mm)	
	Width	2.75 in (70 mm)	
	Interface	ATA-8, SATA 2.6, 3.0 Gb/s, NCQ	
	Transfer Rate	**Synchronous** (maximum)	300 MB/s (Drive Capability)
	Seek Time (typical reads, including settling)	**Single Track**	3 ms
		Average	13 ms
		Maximum	24 ms
	Rotational Speed	5400 rpm	
	Logical Blocks	976,773,168	
	Operating Temperature	32° to 140° F (0° to 60° C) [case temp]	
	Features	ATA Security	
750 GB* 5400 rpm SATA Hard Drive	**Drive Weight**	0.22 lb (101 g)	
	Capacity	750 GB	
	Height	0.37 in (9.5 mm)	
	Width	2.75 in (70 mm)	
	Interface	ATA-8, SATA 2.6, 3.0 Gb/s, NCQ	
	Transfer Rate	**Synchronous** (maximum)	300 MB/s (Drive Capability)
	Seek Time (typical reads, including settling)	**Single Track**	3 ms
		Average	13 ms
		Maximum	24 ms
	Rotational Speed	5400 rpm	
	Logical Blocks	1,465,149,168	
	Operating Temperature	32° to 140° F (0° to 60° C) [case temp]	
	Features	ATA Security	

Technical Specifications

1 TB* 5400 rpm SATA Hard Drive	**Drive Weight**	0.254 lb (115 g)	
	Capacity	1 TB	
	Height	0.37 in (9.5 mm)	
	Width	2.75 in (70 mm)	
	Interface	ATA-8, SATA 2.6, 3.0 Gb/s, NCQ	
	Transfer Rate	**Synchronous** (maximum)	300 MB/s (Drive Capability)
	Seek Time (typical reads, including settling)	**Single Track**	3 ms
		Average	13 ms
		Maximum	24 ms
	Rotational Speed	5400 rpm	
	Logical Blocks	1,953,525,168	
	Operating Temperature	32° to 140° F (0° to 60° C) [case temp]	
	Features	ATA Security	
500 GB* 5400 rpm SMART SATA II Hybrid HDD/SSHD	**Drive Weight**	0.209 lb (95 g)	
	Capacity	500 GB	
	Height	0.276 in (7 mm)	
	Width	2.76 in (70.1 mm)	
	Interface	ATA-8, SATA 2.6, 6.0 Gb/s, NCQ	
	Transfer Rate	**Synchronous** (maximum)	600 MB/s (Drive Capability)
	Seek Time (typical reads, including settling)	**Single Track**	2 ms
		Average	12 ms
		Maximum	NIL ms
	Rotational Speed	7200 rpm	
	Logical Blocks	976,773,168	
	Operating Temperature	32° to 140° F (0° to 60° C) [case temp]	
	Features	ATA Security	

Technical Specifications

SATA 6 Gb/s 128 GB*, 2.5-inch Solid State Drive	**Drive Weight**	73 Grams	
	Capacity	128 GB	
	Height	0.276 in (7 mm)	
	Width	2.76 in (70 mm)	
	Interface	SATA 3 (6 Gb/s)	
	Performance	**Maximum Sequential Read**	**Maximum Sequential Write**
		415 MB/s	175 MB/s
	Logical Blocks	250,069,680	
	Operating Temperature	32° to 158°F (0° to 70°C) [case temp]	
	Features	ATA Security; ATA-8; SATA 3.0; DIPM; TRIM	

* For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 16 GB (for Windows 7) and 36 GB (for Windows 8) of system disk is reserved for the system recovery software.

Optical Drives

DVD+/-RW SuperMulti DL Drive	**Access Times**	Random	<140ms CD (typical) < 160 ms DVD (typical)
	Max Data Transfer Rate	24X CD-ROM 8X DVD 24X CD-R 24X CD-RW 8X DVD+R 8X DVD+RW 8X DVD-R 6X DVD-RW 6X - DVD+R Dual Layer 6X - DVD-R Dual Layer 5X DVD-RAM	
	Transfer Mode	UDMA Mode 5	
	Interface	Gen 1 SATA	
	Supported Media (read)	CD-DA, CD-TEXT, CD-ROM, CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo-CD, Video CD), Multisession CD (Photo-CD, CD-EXTRA, Portfolio, CD-R, CD-RW), CD-R, CD-RW, DVD-ROM (DVD-5, DVD-9, DVD-10, DVD-18), DVD-R, DVD-RW, DVD+R, DVD+RW, DVD-RAM	
	Supported Media (write)	CD-R, CD-RW, DVD+R, DVD+RW, DVD-R, DVD-RW, DVD-RAM, DVD+R DL, DVD-R DL	
	Max Media Capacity (read)	8.5 GB	
	Max Media Capacity (write)	8.5 GB	
	Transport	Tray Loading	

Blu-ray ROM DVD+/-RW SuperMulti DL Drive	**Access Times**	Random	<190 ms CD-ROM (typical) <180ms DVD-ROM (typical) <230 ms BD-ROM (typical)
	Max Data Transfer Rate	24X CD-ROM 8X DVD-ROM 24X CD-R 16X CD-RW 8X DVD+R 8X DVD+RW 8X DVD-R 6X DVD-RW 4X - DVD+R Dual Layer 4X - DVD-R Dual Layer 5X DVD-RAM 6X BD-ROM	
	Transfer Mode	UDMA Mode 5	
	Interface	Gen 1 SATA	
	Supported Media (read)	CD-DA, , CD-TEXT, CD-ROM, CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo-CD, Video CD), Multisession CD (Photo-CD, CD-EXTRA, Portfolio, CD-R, CD-RW), CD-R, CD-RW, DVD-ROM (DVD-5, DVD-9, DVD-10, DVD-18), DVD-R, DVD-RW, DVD+R, DVD+RW. DVD-RAM, BD-ROM, BD-R, BD-RE	
	Supported Media (write)	CD-R, CD-RW, DVD+R, DVD+R DL, DVD+RW, DVD-R, DVD-R DL, DVD-RW, DVD-RAM	
	Max Media Capacity (read)	50.0 GB	
	Max Media Capacity (write)	8.5 GB	
	Transport	Tray Loading	

SECURITY

HP Fingerprint Reader (optional)	**Mobile Voltage Operation**	3.0V-3.6V Single Supply
	Weight	TBD
	Operating Temperature	32° - 158°F (0° - 70°C)
	Current Consumption @ 3.3V	Less than 70 mA peak imaging and scrolling Less than 25 mA hardware finger detection Advanced Power Management
	High-Rate Image Capture	Up to 240 image frames /sec
	ESD Resistance	IEC 61000-4-2 Level 4 (±15KV)
	Detection Matrix	192 x 16 Pixels 9.7 mm x 0.81 mm 500 ppi High-Resolution Images

NETWORKING/COMMUNICATIONS

Technical Specifications

Integrated Realtek RTL8151FH-CG 10/100/1000 NIC	**Ethernet Features**	10 Mbit/s operation (10BASE-T; IEEE 802.3i; IEEE 802.3 clauses 13-14) 100 Mbit/s operation (100BASE-TX; IEEE 802.3u; IEEE 802.3 clauses 21-30) 1000 Mbit/s operation (1000BASE-T; IEEE 802.3ab; IEEE 8023 clauses 40) Auto-Negotiation (Automatic Speed Selection) Full Duplex Operation at all Speeds, Half Duplex operation at 10 and 100 Mbit/s IEEE 802.1p QoS (Quality of Service) Support IEEE 802.1q VLAN support IEEE 802.3x Flow Control (IEEE 802.3 clauses 31-32; configurable) IEEE 802.3az EEE (Energy Efficient Ethernet) Jumbo Frame 9K Auto MDI/MDIX Crossover cable detection
	Weight	TBD
	Power Management	ACPI compliant - multiple power modes Situation-sensitive features reduce power consumption Advanced link down power saving for reducing link down power consumption
	Performance Features	TCP/IP/UDP Checksum Offload (configurable) Protocol Offload (ARP & NS) Large send offload and Giant send offload Receiving Side Scaling
	Manageability	Wake-on-LAN from standby and hibernation (Magic Packet and Microsoft Wake-Up Frame); Wake-on-LAN from off (Magic Packet only) PXE 2.1 Remote Boot Statistics Gathering (SNMP MIB II, Ethernet-like MIB, Ethernet MIB (802.3x, clause 30)) Comprehensive diagnostic and configuration software suite Virtual Cable Doctor for Ethernet cable status
	Interface	PCI Express 1.1 x1 to fully support ASPM L0s/L1 and CLKREQ
	NIC Device Driver Name	Realtek PCIe GBE Ethernet Family Controller
HP hs3110/3114 HSPA+ Mobile Broadband Module*	**Technology/Operating Bands**	Modes: WCDMA/HSDPA/HSUPA/HSPA+/AWS/GSM/EDGE/GPRS Penta-band WCDMA/HSDPA/HSUPA/HSPA+/AWS: 850/900/1900/2100/AWS MHz GSM/GPRS/EDGE: 850/900/1800/1900 MHz
	Wireless Protocol Standards	GSM/GPRS/EDGE: Class B, Multi-slot class 33, coding schemes CS1 - CS4 and MSC1 - MSC9. UMTS/WCDMA: Release 99 and Release 7 Advanced Receiver Type 3i
	GPS	GPS Standalone, A-GPS: L1 (Internet- and Network assisted)
	Wireless Parametric Standards	Complies with 3GPP specifications
	Maximum Data Rates	GPRS/EDGE: Multi-slot Class 33, Class B WCDMA PS: UL (384 kbps) / DL (384 kbps) UL/DL HSPA: UL (5.76 Mbps)/ DL (7.2 Mbps) UL/DL HSPA+: UL (5.76 Mbps)/ DL (21Mbps)

	Maximum Output Power	WCDMA/HSPA/HSPA+ 2100/1900/900/850/AWS MHz: +24dBm (Power Class 3) GPRS 1900/1800 MHz: +30dBm (Power Class 1) GPRS 900/850 MHz: +33dBm (Power Class 4) EDGE 1900/1800 MHz: +26dBm (Power Class E2) EDGE 900/850 MHz: +27dBm (Power Class E2)
	Maximum Power Consumption	2500mA (peak); 600mA (average)
	Power Consumption, Sleep Mode	3.6 mA
	Power Management	USB selective suspend, Connected Standby Integrated notebook wireless button
	Antenna Type	Dual high efficiency 5 band antennae with spatial diversity, mounted in the display enclosure
	Form Factor	M.2 Socket 2, USB 2.0 interface high speed
	Weight	<6 g
	Dimensions (Length x Width x Thickness)	2.01 x 1.18 x 0.18 in (42 x 30 x 2.3 mm)
	SIM card supply voltage	1.8 V/3.0 V UICC (SIM/UICC/USIM)
	Voltage, Operating	3.135V~4.4V (3.3 V recommended)
	Temperature, Operating	14° to 131° F (-10° to 55° C) (Normal operation) -4° to 158° F (-20° to 70° C) (Extended operation)
	Temperature, Storage	-40° to 185° F (-40° to 85° C)
	Humidity	5% to 95%
	Configuration utilities	HP Connection Manager
	LED Activity	LED Off - Radio Off; Solid LED On - Radio On

* Mobile Broadband is an optional feature sold separately or as an add on feature. Connection requires wireless data service contract, network support, and is not available in all areas. Contact service provider to determine the coverage area and availability. Connection speeds will vary due to location, environment, network conditions, and other factors.

Realtek 802.11 b/g/n (1x1)*	**Wireless LAN Standards**	IEEE 802.11b IEEE 802.11g IEEE 802.11n
	Interoperability	Wi-Fi certified
	Frequency Band	2.402 - 2.482 GHz
	Data Rates	802.11b: 1, 2, 5.5, 11 Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n: card will support rates for NSS=1 for RX and TX for 20 MHz channels. Short and long guard interval will be supported.
	Modulation	Direct Sequence Spread Spectrum BPSK, QPSK, CCK, 16-QAM, 64-QAM
	Security[1]	IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only AES-CCMP: 128 bit in hardware 802.1x authentication types WPA, WPA2:

	802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES. WPA2 certification IEEE 802.11i Cisco Certified Extensions, all versions through V5 WAPI	
Network Architecture	Ad-hoc (Peer to Peer)	
Models	Infrastructure (Access Point Required)	
Roaming	IEEE 802.11 compliant roaming between access points	
Output Power[2]	13.5 dBm, nominal	
Power Consumption	Transmit: 2.0 W (max) Receive: 1.6 W (max) Associated to Access Point, Idle: 250 mW nominal Wireless Button Off: 100 mW nominal Radio disabled: 75 mW nominal	
Power Management	ACPI compliant power management 802.11 compliant power saving mode	
Receiver Sensitivity[3]	802.11b:-95 dBm (1 Mbps), -93 dBm (2 Mbps), -91 dBm (5.5 Mbps), -88 dBm (11 Mbps) 802.11g:-90 dBm (6 Mbps), -89 dBm (9 Mbps), -87 dBm (12 Mbps), -85 dBm (18 Mbps), -82 dBm (24 Mbps), -79 dBm (36 Mbps), -76 dBm (48 Mbps), -74 dBm (54 Mbps) 802.11n:-70dBm (72.2 Mbps)	
Antenna type	High efficiency antenna with spatial diversity, mounted in the display enclosure	
Form Factor	PCI-Express Half-MiniCard	
Weight	0.013 lb (6 g)	
Dimensions	0.19 x 1.06 x 1.18 in (4.75 x 26.8 x 30 mm)	
Operating Voltage	3.3v +/- 9%	
Temperature	Operating Non-operating	14° to 158° F (-10° to 70° C) -40° to 176° F (-40° to 80° C)
Humidity	Operating Non-operating	10% to 90% (non-condensing) 5% to 95% (non-condensing)
Altitude	Operating Non-operating	0 to 10,000 ft (3,048 m) 0 to 50,000 ft (15,240 m)
LED Activity	LED Off - Radio OFF; Solid LED On - Radio ON	

1. Check latest software/driver release for updates on supported security features.
2. Maximum output power may vary by country according to local regulations.
3. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CKK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).

* Wireless access point and internet service required. Availability of public wireless access points limited.

Intel Dual Band Wireless-AC 3160 802.11 ac (1x1) WiFi and Bluetooth 4.0	**General**	**Dimensions** (H x W x D)	Standard: 26.80 mm x 30.00 mm x 2.4 mm Max (Top Side) / 1.35 mm Max (Bottom Side) Low profile: 22 mm x 30.00 mm x 1.5 mm Max

Technical Specifications

Combo Adaptor*			(Top Side) / 0.6 mm Max (Bottom Side) NGFF: 22 mm x 30 mm, single sided
		Weight	TBD
		Diversity	No diversity support
		Radio ON/OFF Control	Supported in both hardware and software
		Connector interface	Half Mini Card form factor, based on PCIe electrical interface Next Generation Form Factor, A-SD electrical interface definition support
		LED Output	On/Off
		Operating Temperature (Adapter Shield)	0° to +80° C
		Humidity Non-Operating	50% to 90% RH non-condensing (at temperatures of 25°C to 35°C)
		Operating Systems	Microsoft Windows 7, Microsoft Windows 8, Linux
		Wi-Fi Alliance	Wi-Fi CERTIFIED for 802.11ac, Wi-Fi CERTIFIED a/b/g, Wi-Fi CERTIFIED n, WMM, WPA, WPA2, and WPS, WPS 2.0, Protected Management Frames, Wi-Fi Direct for peer to peer device connections
		Microsoft WHQL	Yes
		IEEE WLAN Standard	IEEE 802.11abgn, 802.11ac, 802.11d, 802.11e, 802.11i, 802.11h, 802.11w
		Architecture	Infrastructure and SoftAP; Supports simultaneous Client and SoftAP modes in 2.4 GHz or 5GHz
		Roaming[1]	ACPI and PCI Express compliant power management 802.11 compliant power saving mode
	Security	**Authentication**	WPA and WPA2, 802.1X (EAP-TLS, TTLS, PEAP, LEAP, EAP-FAST), EAP-SIM, EAP-AKA
		Authentication Protocols	PAP, CHAP, TLS, GTC, MS-CHAP, MS-CHAPv2
		Encryption	64-bit and 128-bit WEP, AES-CCMP, TKIP
		Wi-Fi Direct Encryption and Authentication	WPA2, AES-CCMP
		Product Safety	UL, C-UL, CB (IEC 60950-1)
		Management Frame Protection	802.11w (WFA- Protected Management Frames)
	Compliance	**Retail (Credit Card Processing)**	PCI, CISP
		Government	FIPS[2],FISMA

1. Roaming is supported only within each respective band and mode of access points.
2. Microsoft Windows 7 only.

HP Integrated Module with Bluetooth 4.0+EDR Wireless Technology

Bluetooth Specification	Dual Mode Bluetooth* 2.1, 2.1+EDR, 3.0, 3.0+HS, 4.0 (BLE)
Dimensions	1.18 x 0.26 x 0.13 in (30 x 6.5 x 3.25 mm)

Technical Specifications

Frequency Band	2402 to 2480 MHz	
Number of Available Channels	79 (1 MHz) available channels	
Data Rates and Throughput	3 Mbps data rate; throughput up to 2.17 Mbps Synchronous Connection Oriented links up to 3, 64 kbps, voice channels Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric	
Transmit Power	-1.5 dBm to 4 dBm (Bluetooth Class II)	
Receiver Sensitivity	Better than -20 dBM at 0.1 % raw bit error rate	
Power Consumption	Peak (Tx) 264 mW Peak (Rx) 231 mW Sleep <1 mW	
Antenna	Internally integrated within module	
Range	Up to 33 ft (10 m)	
Electrical Interface	USB 2.0 compliant Microsoft Windows Plug and Play compliant	
Bluetooth Software Supported	Broadcom Bluetooth for Windows Microsoft Windows Bluetooth Software	
Link Topology	Point to Point, Multipoint Pico Nets up to 7 slaves	
Security	Full support of Bluetooth Security Provisions	
Power Management	Microsoft Windows ACPI, and USB Bus Support Self configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff	
Certifications	All necessary regulatory approvals for supported countries, including: FCC (47 CFR) Part 15C, Section 15.247 & 15.249 ETS 300 328, ETS 300 826 Low Voltage Directive IEC950 UL, CSA, and CE Mark	
Temperature	Operating Non-operating	-14° to 158° F (-10° to 70° C) -40° to 212° F (-40° to 100° C)
Humidity	Operating Non-operating	0% to 90% 0% to 95%
Altitude	Operating Non-operating	15,000 ft (4,572 m) 40,000 ft (12,192 m)
Bluetooth Profiles Supported	Serial Port Profile (SPP)[1] Service Discovery Application Profile (SDAP) Dial-Up Networking (DUN)[1,2] Generic Object Exchange Profile (GOEP)[1,2] Object Push Profile (OPP)[1,2] File Transfer Profile (FTP) Synchronization Profile (SYNC) Hard Copy Cable Replacement (HCRP)[1,2] Personal Area Networking Profile (PAN)[1,2] Human Interface Device Profile (HID)[1,2] FAX Profile (FAX) Basic Imaging Profile (BIP)[2]	

		Headset Profile (HSP) Hands Free Profile (HFP) Advanced Audio Distribution Profile (A2DP)

1. indicates the profile is supported by Microsoft Windows XP SP2
2. indicates the profile is part of Windows Vista
* Wireless access point and internet service required. Availability of public wireless access points limited. The specifications for the 802.11ac WLAN are draft specifications and are not final. If the final specifications differ from the draft specifications, it may affect the ability of the notebook to communicate with other 802.11ac WLAN devices.

Intel Dual Band Wireless-N 7260 802.11 a/b/g/n (2x2) WiFi + Bluetooth 4.0 Combo Adaptor*	**Wireless LAN Standards**	IEEE 802.11a IEEE 802.11b IEEE 802.11g IEEE 802.11n
	Interoperability	Wi-Fi certified Cisco Compatible Extensions Program compliant with Microsoft Windows 7, Windows Vista and XP (details at: http://www.hp.com/go/notebooks/WLAN)
	Frequency Band	802.11b/g/n 2.402 - 2.482 GHz 802.11a/n 4.9 - 4.95 GHz (Japan) 5.15 - 5.25 GHz 5.25 - 5.35 GHz 5.47 - 5.725 GHz 5.825 - 5.850 GHz
	Antenna Structure	2 transmit; 2 receive (2x2)
	Data Rates	802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11b: 1, 2, 5.5, 11 Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n: card will support rates for NSS=1 and NSS=2 for RX and TX for 20 and 40 MHz channels. Short and long guard interval shall be supported.
	Modulation	Direct Sequence Spread Spectrum CCK, BPSK, QPSK, 16-QAM, 64-QAM
	Security[1]	• IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only • AES-CCMP: 128 bit in hardware • 802.1x authentication • WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES. • WPA2 certification • IEEE 802.11i • Cisco Certified Extensions, all versions through V5 • WAPI
	Sub-channels	Multinational support with frequency bands and channels compliant to local regulations.
	Network Architecture Models	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
	Roaming	IEEE 802.11 compliant roaming between band Access Points
	Output Power[2]	• 2.4G: +13.5dBm minimum • 5G: +12dBm minimum

Power Consumption	Transmit: 2.0 Watts Receive: 1.6 Watts Idle mode[3]: 250 mW (WLAN Associated) Idle mode: 100 mW (WLAN unassociated) Radio off: 75 mW	
Power Management	ACPI and PCI Express compliant power management 802.11 compliant power saving mode	
Receiver Sensitivity[4]	802.11g:-90 dBm (6 Mbps), -89 dBm (9 Mbps), -87 dBm (12 Mbps), -85 dBm (18 Mbps), -82 dBm (24 Mbps), -79 dBm (36 Mbps), -76 dBm (48 Mbps), -74 dBm (54 Mbps) 802.11b:-95 dBm (1 Mbps), -93 dBm (2 Mbps), -91 dBm (5.5 Mbps), -88 dBm (11 Mbps) 802.11g:-90 dBm (6 Mbps), -89 dBm (9 Mbps), -87 dBm (12 Mbps), -85 dBm (18 Mbps), -82 dBm (24 Mbps), -79 dBm (36 Mbps), -76 dBm (48 Mbps), -74 dBm (54 Mbps) 802.11n:-69 dBm (150 Mbps), -66 dBm (300 Mbps)	
Antenna Connections	2 U.FL type connectors (output impedance of 50 ± 2 ohms)	
Form Factor	PCI-Express Half-MiniCard	
Dimensions	0.12 x 1.06 x 1.18 in (3.1 x 26.8 x 30.0 mm)	
Weight	TBD	
Operating Voltage	3.3v +/- 9%	
Temperature	Operating Non-operating	14° to 158° F (-10° to 70° C) -40° to 176° F (-40° to 80° C)
Humidity	Operating Non-operating	10% to 90% (non-condensing) 5% to 95% (non-condensing)
Altitude	Operating Non-operating	0 to 10,000 ft (3,048 m) 0 to 50,000 ft (15,240 m)
LED Activity	LED Off - Radio OFF; Solid LED On - Radio ON	

1. Check latest software/driver release for updates on supported security features.
2. Maximum output power may vary by country according to local regulations.
3. In Power Save Polling mode and on battery power.
4. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CCK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).
5. WLAN supplier's client utility is required for Cisco Compatible Extensions support with Microsoft Windows XP. WLAN may also be compatible with certain third-party software supplicants. WLAN supplier IHV extensions required for Cisco Compatible Extensions support for Microsoft Windows Vista.

HP Integrated Module with Bluetooth 4.0+EDR Wireless Technology

Bluetooth Specification	4.0+EDR Compliant
Dimensions	1.18 x 0.26 x 0.13 in (30 x 6.5 x 3.25 mm)
Frequency Band	2402 to 2480 MHz
Number of Available Channels	79 (1 MHz) available channels

Technical Specifications

Data Rates and Throughput	3 Mbps data rate; throughput up to 2.17 Mbps Synchronous Connection Oriented links up to 3, 64 kbps, voice channels Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric
Transmit Power	-1.5 dBm to 4 dBm (Bluetooth Class II)
Receiver Sensitivity	Better than -20 dBM at 0.1 % raw bit error rate
Power Consumption	Peak (Tx) 264 mW Peak (Rx) 231 mW Sleep <1 mW
Antenna	Internally integrated within module
Range	Up to 33 ft (10 m)
Electrical Interface	USB 2.0 compliant Microsoft Windows Plug and Play compliant
Bluetooth Software Supported	Broadcom Bluetooth for Windows Microsoft Windows Bluetooth Software
Link Topology	Point to Point, Multipoint Pico Nets up to 7 slaves
Security	Full support of Bluetooth Security Provisions
Power Management	Microsoft Windows ACPI, and USB Bus Support Self configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff
Certifications	All necessary regulatory approvals for supported countries, including: FCC (47 CFR) Part 15C, Section 15.247 & 15.249 ETS 300 328, ETS 300 826 Low Voltage Directive IEC950 UL, CSA, and CE Mark
Bluetooth Profiles Supported	Serial Port Profile (SPP)[1] Service Discovery Application Profile (SDAP) Dial-Up Networking (DUN)[1,2] Generic Object Exchange Profile (GOEP)[1,2] Object Push Profile (OPP)[1,2] File Transfer Profile (FTP) Synchronization Profile (SYNC) Hard Copy Cable Replacement (HCRP)[1,2] Personal Area Networking Profile (PAN)[1,2] Human Interface Device Profile (HID)[1,2] FAX Profile (FAX) Basic Imaging Profile (BIP)[2] Headset Profile (HSP) Hands Free Profile (HFP) Advanced Audio Distribution Profile (A2DP)

1. indicates the profile is supported by Microsoft Windows XP SP2
2. indicates the profile is part of Windows Vista

* Wireless access point and internet service required. Availability of public wireless access points limited.

AUDIO/MULTIMEDIA - DTS SOUND+

Hardware	**Implementation**	IDT 92HD91
	Function Key Volume Controls	Volume up, volume down, and mute
	Full Duplex	Yes
	Microphone In	Stereo
	Headphone/Line Out	Stereo
	Integrated Microphone	Yes, dual digital microphone array when equipped with optional webcam
Audio Output Quality	**Frequency Response**	20 Hz - 20 kHz
	Signal to Noise Ratio	>85 dB
	Total Harmonic Distortion	0.01%
	Noise Floor	-110 dB
	Play/Record Sampling Rate(s)	8 kHz - 48kHz
	DAC	16, 20 or 24-bit
	ADC	16 or 20-bit
Integrated Stereo Speakers	**Power Rating**	2 Watts
	Impedance	4 Ohms

POWER

HP 90W Smart AC Adapter (discrete configurations)	**Dimensions**	5.00 x 1.97 x 1.1 in (12.7 x 5.0 x 2.9 cm)	
	Weight	0.82 lb (370 g)	
	Input	100 to 240 VAC	
		Input Efficiency	87% min at 115 VAC
		Input frequency range	47 to 63 Hz
		Input AC current	1.5 A at 90 VAC, 0.75 A at 180 VAC PFC Version 2.4 A at 90 VAC, 1.2 A at 180 VAC NON PFC Version
	Output	**Output power**	90W
		DC output	19.0V
		Hold-up time	5 msec at 115 VAC input
		Output current limit	<11A, Over voltage protection- 29V max automatic shutdown
	Connector	3 pin/grounded, mates with interchangeable cords	
	Environmental Design	**Operating temperature**	32° to 104° F (0° to 40° C)

		Non-operating (storage) temperature	-4° to 149° F (-20° to 65° C)
		Altitude	0 to 10,000 ft (0 to 3,048 m)
		Humidity	20% to 80%
		Storage Humidity	10% to 90%
	EMI and Safety Certifications	CE Mark - full compliance with LVD and EMC directives; Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE; MTBF- over 200,000 hours at 25°C ambient condition.	
HP 65W Smart AC Adapter (Configurations with integrated graphics)	**Dimensions**	4.17 x 1.85 x 1.1 in (10.6 x 4.7 x 2.8 cm)	
	Weight	0.62 lb (280 g)	
	Input	100 to 240 VAC	
		Input Efficiency	87% min at 115 VAC
		Input frequency range	47 to 63 Hz
		Input AC current	1.7 A at 90 VAC, 0.85 A at 180 VAC
	Output	**Output power**	65W
		DC output	18.5V
		Hold-up time	5 msec at 115 VAC input
		Output current limit	<11A, Over voltage protection- 29V max automatic shutdown
	Connector	3 pin/grounded, mates with interchangeable cords	
	Environmental Design	**Operating temperature**	32° to 104° F (0° to 40° C)
		Non-operating (storage) temperature	-4° to 149° F (-20° to 65° C)
		Altitude	0 to 10,000 ft (0 to 3,048 m)
		Humidity	20% to 80%
		Storage Humidity	10% to 90%
	EMI and Safety Certifications	CE Mark - full compliance with LVD and EMC directives; Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE; MTBF - over 200,000 hours at 25°C ambient condition.	

Technical Specifications

9-Cell (93 WHr) Lithium-Ion battery	**Dimensions** (H x W x L)	1.57 x 1.85 x 10.59 in (4.0 x 4.7 x 26.9 cm)	
	Weight (max)	1.07 lb (0.488 kg)	
	Cells/Type	9-cell Lithium-Ion	
	Energy	**Watt-hour Capacity**	93 WHr
		Amp-hour capacity	8.4Ah
		Watt-hour capacity	11.1V
	Temperature	**Operating (Charging)**	32° to 113° F (0° to 45° C)
		Operating (Discharging)	14° to 140° F (-10° to 60° C)
		Non-operating	-4° to 140° F (-20° to 60° C)
	Battery Re-Charge Time	**System in OFF or Standby Mode**	3 to 4 hours
		System ON	4 to 6 hours (depending on system power consumption)
6-Cell (47 WHr) Lithium-Ion battery	**Dimensions** (H x W x L)	0.85 x 1.76 x 10.59 in (2.16 x 4.46 x 26.9 cm)	
	Weight (max)	0.70lb, (0.312kg)	
	Cells/Type	6-cell Lithium-Ion	
	Energy	**Watt-hour Capacity**	10.8V
		Amp-hour capacity	4.4Ah
		Watt-hour capacity	47Wh
	Temperature	**Operating (Charging)**	32° to 113° F (0° to 45° C)
		Operating (Discharging)	14° to 122° F(-10° to 50° C)
		Non-operating	-4° to 122° F (-20° to 50° C)
	Battery Re-Charge Time	**System in OFF or Standby Mode**	2.5 hours
		System ON	3 to 5 hours
	Fuel Gauge LED	No	
	Warranty	1 year	
	Optional Travel Battery Available	No	

ENVIRONMENTAL

Environmental Data

Eco-Label Certifications & Declarations

This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks:

- IT ECO declaration
- US ENERGY STAR®
- EPEAT <Gold> registered in the United States. See http://www.epeat.net for registration status in your country.

HP ProBook 440 G1 Notebook PC

System Configuration

The configuration used for the Energy Consumption and Declared Noise Emissions data for the Notebook model is based on a "Typically Configured Notebook".

Energy Consumption (in accordance with US ENERGY STAR® test method)	**115VAC, 60Hz**	**230VAC, 50Hz**	**100VAC, 60Hz**
Normal Operation	6.21 W	6.30 W	6.08 W
Sleep	0.79 W	0.85 W	0.80 W
Off	0.39 W	0.45 W	0.39 W

NOTE:

Energy efficiency data listed is for an ENERGY STAR® compliant product if offered within the model family. HP computers marked with the ENERGY STAR® Logo are compliant with the applicable U.S. Environmental Protection Agency (EPA) ENERGY STAR® specifications for computers. If a model family does not offer ENERGY STAR® compliant configurations, then energy efficiency data listed is for a typically configured PC featuring a hard disk drive, a high efficiency power supply, and a Microsoft Windows® operating system.

Heat Dissipation*	**115VAC, 60Hz**	**230VAC, 50Hz**	**100VAC, 60Hz**
Normal Operation	21 BTU/hr	22 BTU/hr	21 BTU/hr
Sleep	3 BTU/hr	3 BTU/hr	3 BTU/hr
Off	1 BTU/hr	2 BTU/hr	1 BTU/hr

* Heat dissipation is calculated based on the measured watts, assuming the service level is attained for one hour.

Technical Specifications

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)	Sound Power (LWAd, bels)	Sound Pressure (LpAm, decibels)
Typically Configured - Idle	3.2	29
Fixed Disk - Random writes	3.2	29

Batteries

This battery(s) in this product comply with EU Directive 2006/66/EC

Batteries used in the product do not contain:
Mercury greater the1ppm by weight
Cadmium greater than 20ppm by weight

Battery size: CR2032 (coin cell)
Battery type: Lithium
Battery size: 6-cell high capacity Lithium-Ion battery (optional 8 cell available)
Battery type:

Additional Information

- This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2011/65/EC.
- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive - 2002/96/EC.
- This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).
- This product is in compliance with the IEEE 1680 (EPEAT) standard at the <gold> level, see www.epeat.net
- Plastics parts weighing over 25 grams used in the product are marked per ISO11469 and ISO1043.
- This product contains 0% post-consumer recycled plastic (by wt.)
- This product is 95.78% recycle-able when properly disposed of at end of life.

Packaging Materials

- External:
  - PAPER/Cardboard & misc 325 g
  - PAPER/Corrugated 51 g
- Internal:
  - PLASTIC/EPE-Expanded Polyethylene 68 g
  - PLASTIC/Polyethylene low density 15 g
  - PLASTIC/PET 20 g
  - OTHER/OTHER 20 g
- The PAPER/Cardboard & misc packaging material is made from 40 % recycled content.
- The PAPER/Corrugated packaging material is made from 40 % recycled content.
- The PLASTIC/EPE-Expanded Polyethylene packaging is made from 40 % recycled content.
- The PLASTIC/Polyethylene low density packaging is made from 40 % recycled content.
- The PLASTIC/PET packaging is made from 40 % recycled content.
- The OTHER/OTHER packaging is made from 40 % recycled content.

HP ProBook 450 G1 Notebook PC

System Configuration

The configuration used for the Energy Consumption and Declared Noise Emissions data for the Notebook model is based on a "Typically Configured Notebook".

Energy Consumption (in accordance with US ENERGY STAR® test method)

	115VAC, 60Hz	230VAC, 50Hz	100VAC, 60Hz
Normal Operation	8.86 W	9.30 W	8.97 W
Sleep	0.48 W	0.56 W	0.46 W
Off	0.33 W	0.43 W	0.33 W

NOTE:

Energy efficiency data listed is for an ENERGY STAR® compliant product if offered within the model family . HP computers marked with the ENERGY STAR® Logo are compliant with the applicable U.S. Environmental Protection Agency (EPA) ENERGY STAR® specifications for computers. If a model family does not offer ENERGY STAR® compliant configurations, then energy efficiency data listed is for a typically configured PC featuring a hard disk drive, a high efficiency power supply, and a Microsoft Windows® operating system.

Heat Dissipation*

	115VAC, 60Hz	230VAC, 50Hz	100VAC, 60Hz
Normal Operation	30 BTU/hr	32 BTU/hr	31 BTU/hr
Sleep	2 BTU/hr	2 BTU/hr	2 BTU/hr
Off	1 BTU/hr	1 BTU/hr	1 BTU/hr

* Heat dissipation is calculated based on the measured watts, assuming the service level is attained for one hour.

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)

	Sound Power (LWAd, bels)	Sound Pressure (LpAm, decibels)
Typically Configured - Idle	3.2	27
Fixed Disk - Random writes	3.2	27

Batteries

This battery(s) in this product comply with EU Directive 2006/66/EC

Batteries used in the product do not contain:
Mercury greater the1ppm by weight
Cadmium greater than 20ppm by weight

Battery size: CR2032 (coin cell)
Battery type: Lithium
Battery size: 6-cell high capacity Lithium-Ion battery (optional 8 cell available)
Battery type:

Additional Information

- This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2011/65/EC.
- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive - 2002/96/EC.
- This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).
- This product is in compliance with the IEEE 1680 (EPEAT) standard at the <gold> level, see www.epeat.net
- Plastics parts weighing over 25 grams used in the product are marked per ISO11469 and

ISO1043.

- This product contains 0% post-consumer recycled plastic (by wt.)
- This product is 96.08% recycle-able when properly disposed of at end of life.

Packaging Materials

- External:
  - PAPER/Corrugated 560.5 g
- Internal:
  - PLASTIC/EPE-Expanded Polyethylene 37 g
  - PLASTIC/Polyethylene low density 24 g
  - PLASTIC/PET 2.5 g
  - OTHER/OTHER 20 g
- The PAPER/Corrugated packaging material is made from 40 % recycled content.
- The PLASTIC/EPE-Expanded Polyethylene packaging is made from 40 % recycled content.
- The PLASTIC/Polyethylene low density packaging is made from 40 % recycled content.
- The PLASTIC/PET packaging is made from 40 % recycled content.
- The OTHER/OTHER packaging is made from 40 % recycled content.

ALL MODELS

MATERIAL USAGE

This product does not contain any of the following substances in excess of regulatory limits (for reference of these limits please refer to the HP General Specification of the Environment (http://www.hp.com/hpinfo/globalcitizenship/environment/supplychain/gen_specifications.html):

- Asbestos
- Certain Azo Colorants
- Certain Brominated Flame Retardants – may not be used as flame retardants in plastics
- Cadmium
- Chlorinated Hydrocarbons
- Chlorinated Paraffins
- Formaldehyde
- Halogenated Diphenyl Methanes
- Lead carbonates and sulfates
- Lead and Lead compounds
- Mercuric Oxide Batteries
- Ozone Depleting Substances
- Polybrominated Biphenyls (PBBs)
- Polybrominated Biphenyl Ethers (PBBEs)
- Polybrominated Biphenyl Oxides (PBBOs)
- Polychlorinated Biphenyl (PCB)
- Polychlorinated Terphenyls (PCT)
- Polyvinyl Chloride (PVC) – except for wires and cables, and certain retail packaging has been voluntarily removed from most applications.
- Radioactive Substances
- Tributyl Tin (TBT), Triphenyl Tin (TPT), Tributyl Tin Oxide (TBTO)
- Nickel finishes that release greater than 0.5 µgrams/cm^2/week, measured according to EN 1811:1998, are not used on any product surface designed to be frequently handled or touched by users.

END-OF-LIFE MANAGEMENT AND RECYCLING

Hewlett-Packard offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: http://www.hp.com/go/reuse-recycle or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner.

The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: http://www.hp.com/go/recyclers. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.

HEWLETT-PACKARD CORPORATE ENVIRONMENTAL INFORMATION

For more information about HP's commitment to the environment:

Global Citizenship Report
http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html
Environment website
http://www.hp.com/environment
Eco-label certifications
http://www.hp.com/hpinfo/globalcitizenship/environment/productdesign/ecolabels.html
ISO 14001 certificates:
http://www.hp.com/hpinfo/globalcitizenship/environment/operations/envmanagement.html

Country of Origin

China

Options and Accessories (sold separately and availability may vary by country)

Type	Description	Part #
Cases	HP Business Nylon Case	H5M92AA
	HP Business 4 Wheel Roller Case	H5M93AA
	HP Business Backpack (up to 17.3")	H5M90AA
Docking	HP LCD Monitor Stand	QM196AA
	HP Dual Hinge Notebook Stand	AW661AA#xxx
	HP USB 2.0 Port Replicator	H1L07AA#xxx
	HP USB 3.0 Port Replicator	H1L08AA#xxx
Input/Output - Mice	HP Wireless Mobile Mouse	H2L63AA
	HP X4000b Bluetooth Mouse	H3T50AA#xxx
Input/Output - Keyboards	HP USB Essential Keyboard/Mouse	H6L29AA
	HP Stylish Wireless KB/Mouse	H4B79AA
Memory	HP 2GB DDR3L-1600 1.35V SODIMM	H6Y73AA#XXX
	HP 4GB DDR3L-1600 1.35V SODIMM	H6Y75AA#XXX
	HP 8GB DDR3L-1600 1.35V SODIMM	H6Y77AA#XXX
Adapters	90W Slim Combo Adapter	H4A41AA#xxx
	90W w/USB Universal Adapter	H4A43AA#ABA
	90W Smart Auto/Truck Adapter	ED493AA
	HP 65W Slim Adapter	AX727AA#XXX
Security	HP Notebook Combo Lock	AY475AA#XXX
	HP UltraSlim Keyed Cable Lock	H4D73AA
Storage - External Storage	HP Mobile USB DVDRW Non-LS	A2U57AA
Health and Education	HP EliteDisplay E271i 27-inch IPS LED Monitor	D7Z72AA/A8/AS/AT
	HP EliteDisplay E231 23-inch LED Monitor	C9V75AA/A8/AS/AT
	HP EliteDisplay E201 20-inch LED Monitor	C9V73AA/A8/AS/AT
	HP ProDisplay P221 21.5" LED Monitor	C9E49AA/A8/AS/AT
	HP ProDisplay P201 20" LED Monitor	C9F26AA/A8/AS/AT

Options and Accessories (sold separately and availability may vary by country)

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